STATEMENT

I, Futoshi Suzuki, a citizen of Japan, residing at 3D, Kopo-Shimizu, 1839 Noritake, Gifu-shi, Gifu-ken, Japan, hereby state that I am the translator of the attached document and I believe it is an accurate translation of the Japanese Patent Application No. 2002-373010, filed on December 24, 2002.

Futoshi Suzuki

Futoshi SUZUKI
Translator
Dated this 1st date of February, 2004

PATENT OFFICE

JAPANESE GOVERNMENT

This is to certify that the annexed is a true copy of the following application as filed with this Office.

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[Inventor]

[Address] c/o PACIFIC INDUSTRIAL CO., LTD. 100 KYUTOKU-CHO, OGAKI, GIFU

[Name] Hisashi KAYUKAWA

[Applicant for Patent Application]

[Registration Number]000204033

[Name] PACIFIC INDUSTRIAL CO., LTD.

[Agent]

[ID Number] 100068755

[Patent Attorney]

[Name] Hironori ONDA

[Appointed Agent]

[ID Number] 100105957

[Patent Attorney]

[Name] Makoto ONDA

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[Name of Document] Drawings 1

[Name of Document] Abstract 1

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[Title of Document] Specification

[Title of the Invention] VALVE FOR TRANSMITTER IN TIRE CONDITION MONITORING APPARATUS

[Scope of the Invention]

[Claim 1] A valve for a transmitter in a tire condition monitoring apparatus, comprising:

a valve stem for filling the interior of the tire with air;

a casing for accommodating an electronic component for transmitting data representing the tire condition;

coupling means that couples the valve stem with the casing, wherein the coupling means permits an installment angle of the casing with respect to the valve stem to be adjustable.

[Claim 2] The valve for a transmitter in a tire condition monitoring apparatus according to claim 1:

wherein a pair of grooves are formed in a lower portion of the valve stem, which is embedded in the tire, and

wherein a pair of projections are formed in the coupling means, the projections being fitted to the pair of the grooves formed in the valve stem.

[Claim 3] The valve for a transmitter in a tire condition monitoring apparatus according to claim 1 or 2:

wherein, when a valve nut for attaching the valve stem to the wheel is fastened, the coupling means is also fastened.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application]

The present invention relates to a wireless tire condition monitoring apparatus that permits a driver in a vehicle passenger compartment to check the conditions of tires, such as the air pressure. More specifically, the present invention relates to a valve for a transmitter in a tire condition monitoring apparatus.

[0002]

[Prior Art]

Some transmitters for tire condition monitoring apparatus have a valve stem that is formed integrally with a casing and functions as a transmission antenna. The casing accommodates electronic elements for transmitting data, which data represents the condition of a tire. Such a casing includes a flange extending outward from the bottom and triangular reinforcing ribs between the flange and the outer surface of the casing. Thus, even if tire beads contact the casing when changing tires, the tire beads move onto the casing. Therefore, the tire is replaced without damaging the casing (Japanese Laid-Open Patent Publication No. 2000-081358).

[0003]

[Patent Document 1]

Japanese Laid-Open Patent Publication No. 2000-081358 (Fig. 1)

[0004]

[Problems that the Invention is to Solve]

However, the art disclosed in Patent Document 1 cannot be applied to all the wheels of a vehicle. That is, there are many different types of cross-sectional shapes in wheels. The cross-sectional shapes in wheels include a deep rim, a shallow rim, a wide flat rim, and wide deep rim. Therefore, the angle defined by a valve stem and a casing is determined by the cross-sectional shape of a wheel. As a result, to attach a casing to a drop center of a wheel, a valve for a transmitter in a tire condition monitoring apparatus must correspond to the cross-sectional shape of the wheel.

[0005]

Accordingly, it is an objective of the present invention to provide a valve for a transmitter in a tire condition monitoring apparatus, which valve can be attached to wheels having different cross-sectional shape.

[0006]

[Means for Solving the Problems]

To achieve the above objective, the invention according to claim 1 provides a valve for a transmitter in a tire condition monitoring apparatus, comprising: a valve stem for filling the interior of the tire with air; a casing for accommodating an electronic component for transmitting data representing the tire condition; coupling means that couples the valve stem with the casing, wherein the coupling means permits an installment angle of the casing with respect to the valve stem to be adjustable.

[0007]

The invention according to claim 2 provides the valve for a transmitter in a tire condition monitoring apparatus according to claim 1: wherein a pair of grooves are formed in a lower portion of the valve stem, which is embedded in the tire, and wherein a pair of projections are formed in the coupling means, the projections being fitted to the pair of the grooves formed in the valve stem.

[0008]

The invention according to claim 3 provides the valve for a transmitter in a tire condition monitoring apparatus according to claim 1 or 2: wherein, when a valve nut for attaching the valve stem to the wheel is fastened, the coupling means is also fastened.

[0009]

[Embodiment]

A valve for a transmitter in a tire condition monitoring apparatus according to one embodiment will now be described with reference to the drawings.

[0010]

As shown in Fig. 1(a), a valve stem 10 has a threaded cap receiving portion 11 and a threaded fixing portion 12 for fixing the valve stem 10 to a wheel. The diameter of the cap receiving portion 11 is less than the diameter of the fixing portion 12. An engaging groove 13 is formed at a portion below the fixing portion 12. Below the engaging groove 13,

that is, at a lower portion of the valve stem 10 that is embedded in a tire, a pair of arcuate grooves 14. A through hole for filling the tire with air extends through the valve step 10. An air valve is provided in the through hole.
[0011]

As shown in Fig. 1(b), an odd shaped washer 20 has an circular projecting edge 21 at an upper inside circumference. A pair of arcuate recesses 22 are formed at the lower part of the odd shaped washer 20. The radius of curvature of the recesses is substantially the same as the grooves 14 shown in Fig. 1(a).
[0012]

As shown in Fig. 1(c), coupling means, which is a housing member 30, has a pair of flat plate portions 31, rising portion 32, and a pair of arcuate portions 33. The flat plate portions 31 are fixed to a casing (not shown) that accommodates electronic elements. The rising portion 32 is located between the flat plate portions 31. The arcuate portions 33 extend from the rising portion 32. The radius of curvature of the projections 33 is substantially the same as the arcuate recesses 22 shown in Fig. 1(b). The thickness of the projection 33 is substantially the same as an height 14a of the grooves 14. A space 34 having an open end is defined between the projections 33. A width 34a of the space 34 is substantially the same a distance 14b between the grooves 14.
[0013]

A procedure for attaching a valve 1 of a transmitter in the tire condition monitoring apparatus to a wheel 2 will now be described. The casing 40 for accommodating electronic element has been fixed to the flat plate portions 31 of the housing member 30 through insert molding in advance.
[0014]

As shown in Fig. 2, an O ring 15 is engaged with the engaging groove 13 of the valve stem 10. The valve step 10 is fitted to the odd-shaped washer 20. The grooves 14 formed at

a lower portion of the valve stem 10 are fitted to the projections 33 having an open end. That is, the groove 14 of the valve stem 10 is fitted to the projections 33 to arrange the valve stem 10 in the space 34. At this time, the odd-shaped washer 20 is arranged such that no gap is created between the arcuate recesses 22 formed at the lower side of the washer 20 and the arcuate portions 22.

[0015]

Subsequently, the valve stem 10 is put through the valve hole 3 from the inside of the wheel 2 so that the O ring 15 engaged with the engaging groove 13 of the valve stem 10 to contact the valve hole 3. Also, the circular edge 21 formed on the upper inside of the odd-shaped washer 20 contacts the valve hole 3. Accordingly, the O ring 15 is stopped in the valve hole 3 to ensure the airtightness of the tire.

[0016]

As shown in Fig. 3, when the casing 40 is pressed against the drop center 4 of the wheel 2, the projections 33 are moved along the arcuate grooves 14 of the valve stem 10. As a result, an installment angle θ defined by the valve stem 10 and the casing 40 is changed according to the cross-sectional shape of the wheel 2. In this state, the washer 50 is fitted to the valve stem 10 from the outside of the wheel 2. Then, a valve nut 60 is threaded to the fixing portion 12 of the valve stem 10 from the outside of the wheel 2.

[0017]

When threading the valve nut 60, the grooves 14 of the valve stem 10 are engaged with the projections 33 of the housing portion 30. Further, the casing 40 is pressed against the drop center 4 of the wheel 2. Thus, when threading the valve nut 60, the valve stem 10 receives a force toward the outside of the wheel 2. As a result, the odd-shaped washer 20 is pressed by the wheel 2 and the housing portion 30. In other words, threading the valve nut 60 to the fixing portion 12 of the valve stem 10 determines the arrangement of the odd-

shaped washer 20 relative to the housing portion 30. Accordingly, the position of the casing 40 is determined relative to the valves stem 10.

[0018]

That is, threading the valve nut 60 to the fixing portion 12 of the valve stem 10 completes the fastening of the device, and the valve stem 10 is installed in the wheel 2. At the same time, the threading of the valve nut 60 determines the installment position of the casing 40. In this manner, the transmitter valve 1 of the tire condition monitoring apparatus is attached to the wheel 2. Thereafter, a valve cap 70 is threaded to the cap receiving portion 11 to complete the installment of the transmitter valve 1 of the tire condition monitoring apparatus.

[0019]

The preferred embodiment has the advantages described below.

(1) The grooves 14 formed at a lower portion of the valve stem 10 are fitted to the projections 33 having an open end. That is, the valve stem 10 is arranged in the space 34 defined by the projections 33. Therefore, when the casing 40 is pressed against the drop center 4 of the wheel 2, the projections 33 are moved along the arcuate grooves 14 of the valve stem 10. As a result, an installment angle θ defined by the valve stem 10 and the casing 40 is changed according to the cross-sectional shape of the wheel 2. In other words, the installment angle θ is adjustable according to the cross-sectional shape of the wheel 2. Thus, the transmitter valve 1 of the tire condition monitoring apparatus can be installed in wheels 2 having various cross-sectional shapes.

[0020]

(2) The valve stem 10 is attached to the wheel 2 simply by threading the valve nut 60 to the fixing portion 12 of the valve stem 10. At the same time, the threading of the valve nut 60 determines the installment position of the casing 40.

Therefore, the transmitter valve 1 for the tire condition monitoring apparatus is easily attached to the wheel 2. Further, by adjusting the fastening amount of the valve nut 60, the installment angle θ of the valve stem 10 and the casing 40 can be readjusted.

[0021]

(3) Also, the transmitter valve 1 for the tire condition monitoring apparatus may be removed from the wheel 2 and attached to a wheel having a different cross-sectional shape. That is, the present invention provides a highly versatile transmitter valve 1 for tire condition monitoring apparatus.

[0022]

(4) The transmitter valve 1 for the tire condition monitoring apparatus is attached to the drop center 4 of the wheel 2. This prevents the beads of a tire from contacting the casing 40 when attaching the tire to the wheel 2. Therefore, unlike the prior art, a plurality of reinforcing triangular ribs need not be provided between the flange and the outer surface of the casing 40. It is needless to say that reinforcing ribs may be provided on the assumption that beads can contact the casing 40.

[0023]

The above embodiment may be modified as follows.

In the illustrated embodiment, the O ring 15 is provided at the engaging groove 13 of the valve stem 10. However, instead of the O ring 15, a grommet may be provided at the engaging groove 13 of the valve stem 10.

[0024]

The data representing the condition of the tire may include the pressure and the temperature of the tire.

The illustrated embodiment may be applied to any vehicle having tires. That is, the illustrated embodiment may be applied not only to four-wheel and two-wheel vehicles, but also to multi-wheel vehicles such as a bus and a truck.

[0025]

In the illustrated embodiment, the arcuate grooves 14 of the valve stem 10 are engaged with the projections 33 of the housing portion 30. However, the valve stem 10 may have projections and the housing portion 30 may have arcuate grooves.

The technical ideas that are understood from the above embodiment will hereafter be described.

[0026]

[1] The valve for a transmitter in a tire condition monitoring apparatus according to claim 1 or 2, wherein the pair of projections of the coupling means are movable along the pair of grooves of the valve stem. Since this configuration permits the pair of projections of the coupling means to move along the pair of grooves of the valve stem, the installment angle of the valve stem and the casing can be altered according to the cross-sectional shape of the wheel.

[0027]

[2] The valve for a transmitter in a tire condition monitoring apparatus according to claim 3 or the above item [1], wherein the installment angle of the casing relative to the valve stem can be adjusted by adjusting the fastening amount of the valve nut. This configuration permits the installment angle to be adjusted according to the cross-sectional shape of the wheel. Thus, the transmitter valve for the tire condition monitoring apparatus can be installed in wheels having various cross-sectional shapes.

[0028]

[Effects of the Invention]

As described above, the present invention provides the following advantages.

According to the invention according to any one of claims 1 to 3, a valve for a transmitter in a tire condition monitoring apparatus, which valve can be attached to wheels having different cross-sectional shape, is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[Fig. 1] (a) a perspective view illustrating a valve stem;

(b) a perspective view illustrating an odd shaped washer;

(c) a perspective view illustrating a housing member;

[Fig. 2] a partially cross-sectional perspective view illustrating the valve stem and the odd shaped washer attached to the housing member; and

[Fig. 3] a partially cross-sectional view illustrating a valve for a transmitter in a tire condition monitoring apparatus attached to a wheel.

[Description of the Reference Numerals]

1...transmitter valve for a tire condition monitoring apparatus, 2...wheel, 3...valve hole, 4...drop center, 10...valve stem, 20...odd-shaped washer, 30...housing portion as coupling means, 33...projection, 40...casing, 50...washer, 60...valve nut, and θ...installment angle.

[Title of Document] Abstract

[Abstract]

[Objective] To provide a transmitter valve for a tire condition monitoring apparatus, which valve can be installed in wheels having various cross-sectional shapes.

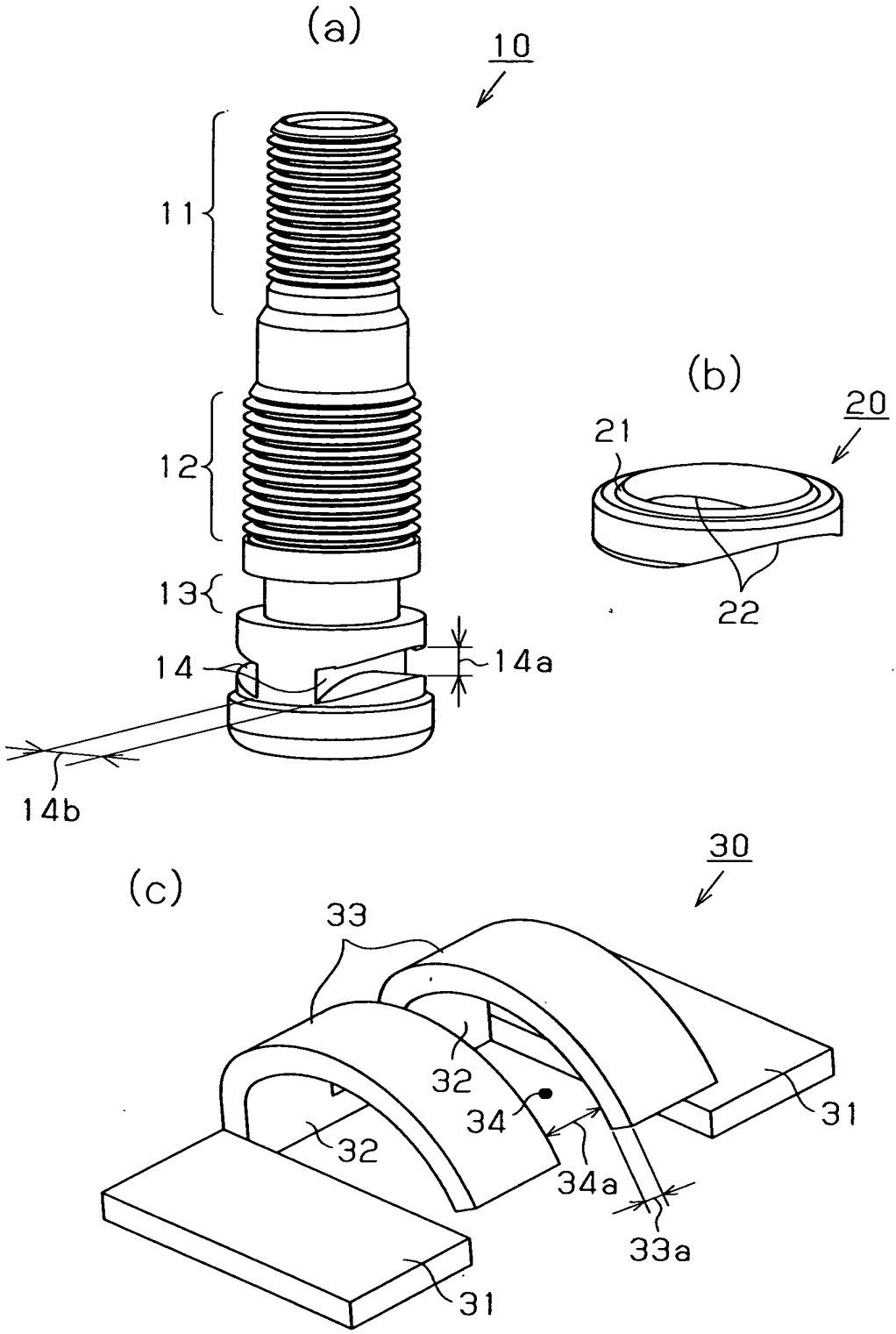
[Means for Solving the Problems] A pair of grooves 14 formed at a lower portion of a valve stem 10 are fitted to a pair of projections 33 having an open end. That is, the valve stem 10 is arranged in the space defined by the projections 33. Therefore, when the casing 40 is pressed against the drop center 4 of the wheel 2, the projections 33 are moved along the arcuate grooves 14 of the valve stem 10. As a result, an installment angle θ defined by the valve stem 10 and the casing 40 is changed according to the cross-sectional shape of the wheel 2.

In other words, the installment angle θ is adjustable according to the cross-sectional shape of the wheel 2.

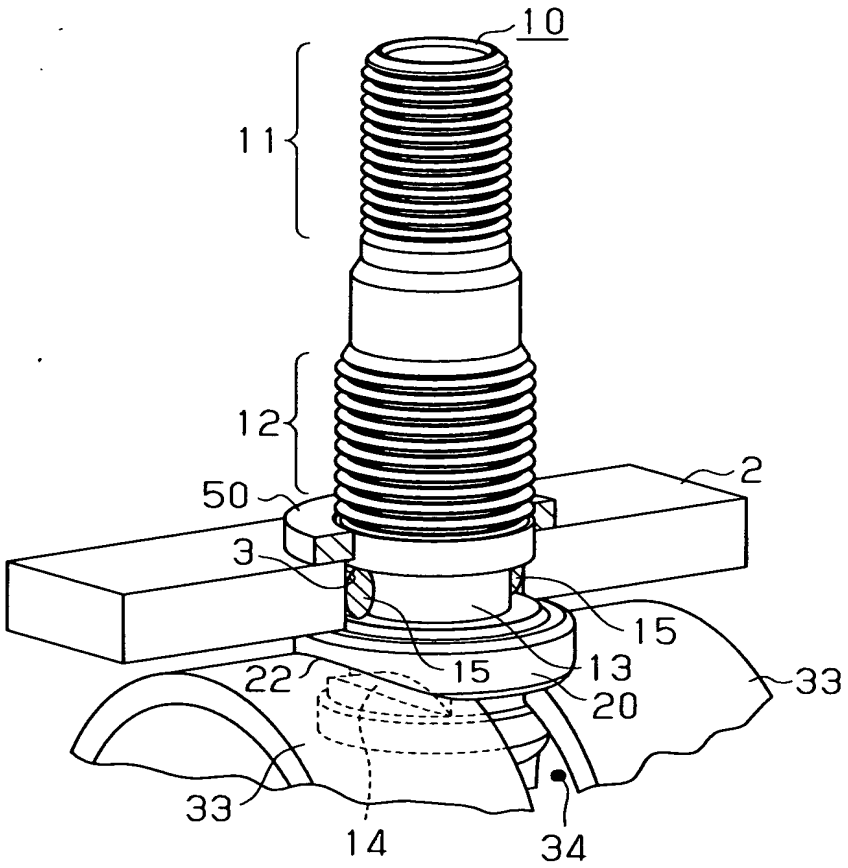
[Selected Drawing] Fig. 3

[Title of Document] Drawings

[Fig.1]



[Fig.2]



[Fig.3]